**Supplemental Specification**
**2005 Standard Specification Book**

**SECTION 03390**

# CONCRETE CURING

**Delete Section 03390 and replace with the following:**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Concrete curing materials and methods.

### 1.2 REFERENCES

A. AASHTO M 148: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

B. AASHTO LRFD Bridge Construction Specifications

C. ASTM C 1315: Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

### 1.3 SUBMITTALS

A. Provide manufacturer's product data, specifications, and recommended installation instructions.

## PART 2 PRODUCTS

### 2.1 CURING COMPOUND FOR STRUCTURAL AND ARCHITECTURAL CONCRETE

A. Meet AASHTO M 148, Type I D, Class A.

### 2.2 CURING COMPOUND FOR PORTLAND CEMENT CONCRETE PAVEMENT

A. Meet AASHTO M 148, Type 2, Class B.

## 2.3 CURING COMPOUND FOR LEAN CONCRETE BASE COURSE

A. Use a curing compound with a wax base.

B. Meet AASHTO M 148, Type 2, Class A.

## 2.4 CURING COMPOUND FOR CONCRETE BARRIER

A. Meet ASTM C 1315, Type 1, Class A.

# PART 3 EXECUTION

## 3.1 PREPARATION

A. Verify concrete surfaces are ready for curing.
   1. Complete all patching or surface finishing before applying compound.

B. Follow product manufacturer's recommendations for preparing surfaces.

C. Keep surfaces moist until the curing compound is applied.

D. Do not dilute or alter the compound.

## 3.2 CURING STRUCTURES

A. Bridge Decks and Approach Slabs.
   1. Apply membrane-curing compound at the manufacturer's recommended rate so that no portion of the deck or approach slab is exposed to the atmosphere for more than 20 minutes after the tining or finishing operation.
   2. Apply membrane-curing compound at a uniform rate of 100 $ft^2$/gal.
   3. Work bridge to follow immediately after the finishing machine to allow application of the curing compound while the concrete is still plastic.
   4. As soon as the concrete is sufficiently set to support the materials, cover bridge decks, approach slabs, curbs, and parapet walls with material that retains moisture and does not prevent evaporation, such as cotton or burlap mats.
      a. Secure the cotton or burlap mats to prevent wind or other forces from removing them.
      b. Do not damage the finish.

5. Keep entire concrete damp continuously for ten days after placement. Do not erode or damage the surface.

B. Other newly placed concrete: Use membrane-curing compound method.
1. Keep surfaces moist until the curing compound is applied.
2. Complete all patching or surface finishing before applying compound.
3. Warm chilled compound that is too viscous to a maximum of 90 degrees F.
4. Apply curing compound immediately after finishing operations are completed
5. Spray the entire surface of the concrete with a membrane curing compound at a uniform rate of 100 $ft^2$/gal.
6. Immediately re-spray any portion damaged before the ten-day curing expires.

## 3.3 CURING CURB, GUTTER, FLATWORK, SIDEWALK, DRIVEWAY, AND OTHER MISC CONCRETE ITEMS (CONCRETE SLOPE PROTECTION)

A. Refer to this Section, article 3.2, paragraph B.

## 3.4 CURING PRESTRESSED CONCRETE

A. Cure following this Section, article 3.2, or article 3.10, until concrete has reached a strength of 4,000 psi or as designated on the plans.

## 3.5 CURING PRECAST CONCRETE BARRIER

A. Cure exposed surfaces immediately after finishing operations are completed.
1. Apply the curing compound at a rate of 100 $ft^2$/gal.

B. After removing form, broom clean the surface of the barrier and apply two coats of curing compound.
1. Apply the first coat at a rate of 100 $ft^2$/gal.
2. Allow the first coat to dry thoroughly before applying the second coat.
3. Apply the second coat at a rate of 200 $ft^2$/gal.

C. Immediately repair any damage to the compound film occurring until seven days after the initial application at no additional cost to Department.

## 3.6 CURING CAST IN PLACE CONCRETE BARRIER

A. Cure immediately after finishing operations are complete.

B. Apply two coats of curing compound following this Section, article 3.5.

C. Immediately repair any damage to the compound film occurring until seven days after the initial application at no additional cost to Department.

## 3.7 CURING PRECAST NOISE WALL

A. Apply curing compound to all exposed surfaces immediately after finishing and when forms are removed.
   1. Apply curing compound at a uniform rate of 100 $ft^2$/gal.

B. For exposed aggregate finishes.
   1. Cover surface of exposed aggregate noise wall panels with a moisture barrier or membrane immediately after initial finishing operations are completed.
   2. Leave cover in place until final finishing operations (exposed aggregate) are performed.
   3. Immediately apply curing compound upon removal of cover and completion of final finishing operations.
   4. Apply curing compound at a uniform rate of 100 $ft^2$/gal.

C. Immediately repair any damage to the compound film occurring until seven days after the initial application at no additional cost to Department.

## 3.8 CURING LEAN CONCRETE BASE COURSE

A. After finishing operations are complete, apply curing compound.
   1. Spray entire exposed area (top and sides) at a rate of 200 $ft^2$/gal.
   2. Hand spray on small areas and areas inaccessible to mechanical spraying equipment.
   3. Provide complete coverage with curing compound at edges, corners, sides, and rough spots.

B. Damage to the film of curing compound occurring within 72 hours of application must be repaired immediately at no additional cost to Department.

## 3.9 CURING PORTLAND CEMENT CONCRETE PAVEMENT

A. Apply curing compound according to manufacturer's recommendations.

B. Thoroughly mix the compound and uniformly disperse the pigment before and during application.

C. Apply compound to the entire pavement surface and exposed edges immediately after completing finishing operations:
   1. Apply the curing compound in two approximately equal applications.
   2. Apply the second application in the opposite longitudinal direction as the first at a combined application rate equal to 100 $ft^2$/gal.
   3. Allow at least 30 minutes between applications.
   4. Small and irregular areas and areas inaccessible to mechanical spraying equipment will be hand sprayed.

D. Stop paving operations if the application of the compound behind the paving machine is delayed until the problem is resolved.
   1. Keep the pavement moist with water until the compound application process is resumed.
   2. Apply the water in a fog-mist spray without damaging the pavement surface texture.

E. Immediately repair any damage to the compound film occurring until seven days after the initial application at no additional cost to Department.

## 3.10 STEAM OR RADIANT HEAT CURING

A. Steam or radiant heat curing may only be used for products manufactured in an established plant.

B. Provide a complete steam or radiant heat curing system approved by the Engineer, including 24 hour temperature control and monitoring devices, and a suitable enclosure to contain live steam and minimize moisture and heat losses.

C. Comply with the requirements of the AASHTO LRFD Bridge Construction Specifications, section 8.11.
   1. Do not apply heat until the concrete has set. Wait four to six hours if retarders are used. If no retarders are used, wait two to four hours.
   2. Heat may be applied to maintain a minimum temperature of 50 degrees F within the curing enclosure while waiting for the concrete to set.
   3. Maintain 100 percent relative humidity in the curing enclosure.
   4. Do not apply heat directly on the concrete or cause localized high temperatures.
   5. When applying heat, increase the ambient air temperature at a rate not to exceed a 40 degrees F per hour until a temperature range of 140 degrees to a maximum160 degrees F is reached.
   6. Maintain the temperature range until the concrete has reached the specified strength.

7. When discontinuing heat, decrease the ambient air temperature at a rate not to exceed a 40 degrees F per hour until reaching a temperature of not more than 20 degrees F above the air temperature to which the concrete will be exposed.
8. For prestressed members, transfer stressing force to the concrete immediately after heat curing has ceased.

END OF SECTION